Mobile Home Energy Audit – MHEA Training

Ivan Karnes and Ben Tucker

Who's Here?

- Trainers
  - Ivan Karnes
  - Ben Tucker
- Who is here?
  - Crews, Auditors, Inspectors, Others?
- Experience with Weatherizing Mobile Homes?

Materials

- Draft Mobile Home Site Assessment Guidance
- Draft Mobile Home Duct Leakage Modeling Guidance
- Sample Mobile Home Information
- Floor Repair Modeling Tool
- Mobile Home Air Leakage
- Mobile Home Duct Leakage Locations
- CAZ Definitions—BPI.org
- HVAC and Ductwork Diagrams

Session Goals

- Why MHEA?
  - MHEA's place in the weatherization process
  - MHEA and conference content
- MHEA Methods
  - Modeling in the Audit
  - Changes
    - Belly Repair and Insulation
    - Duct Sealing
    - Duct Pressure Testing
  - NEAT and MHEA Differences

Agenda

- WA Overview
- MH Site Assessment
- MHEA modeling
  - MHEA Audit
    - Building shell
    - Heating Plant
    - Ducts and Infiltration
  - Mobile home belly repair
  - Mobile home duct sealing
  - Minor Portions of
    - Work orders
    - Libraries
- Questions and Feedback

Weatherization Assistant Overview

- References
  - Oak Ridge National Labs
    - WA Manual *(March 2015)*
    - Online training
      - Tells how the software works
  - Commerce
    - Minnesota Addendum
      - Clarifications and additions

Weatherization Assistant Overview

- WA Manual Addendum
  - Not a substitute for the manual
  - Additions, clarifications, and omissions
  - Read and understand the manual

Weatherization Assistant Overview

- What is Weatherization Assistant?
  - Energy modeling and Measure Selection tool
  - Data management
  - Access based “energy modeling engine”
    - Spread Sheets

Weatherization Assistant Overview

- What is Weatherization Assistant?
  - NEAT
  - MHEA
  - Libraries, set up/ supply
    - Accurate costs

How WA Calculates SIRs

Energy Saving Measure Economics

#	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR
1	Fix roof leak		0	180	0.0
2	General Air Sealing		155	250	6.0
3	Setback [heating]		53	75	9.9
4	Roof Cellulose Loose		282	701	7.0
5	DWH Pipe Insulation		8	15	5.5
6	DWH Tank Insulation		18	40	4.9
7	Belly Fiberglass Loose		76	555	2.4
8	Refrigerator Replacement		65	620	1.2
9	Fix Wiring Problems (Attic)		0	120	0.0

How WA Calculates SIRs

- **CFR 440.21** (e) The energy audit procedures must assign priorities among individual weatherization materials in descending order of their cost-effectiveness

How WA Calculates SIRs

- Understanding WA to make WA work for us
  - Ie. Interactivity "NEAT and MHEA evaluate the interaction between efficiency measures (e.g., since insulation reduces the amount of energy needed for space heating, it also reduces the energy savings from a space-heating system replacement). pg. 1-4 and Chapter 12 Page 4

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Required

Air/ ducts

SIR

Other

WA's Place in Weatherization

Documentation Standards

- **Data Accuracy**
  - Ensure accurate energy modeling
  - Contractors and crews perform work efficiently and effectively.
  - Standards
    - Nearest half foot for house dimensions
    - Nearest foot for door area
    - Nearest inch on windows and door dimensions

WA's Place in Weatherization

Site Drawing Requirements

- Attic, Foundation and Wall dimensions
- Attic, Foundation and Wall Square footage calculations
- Information that affects scope of work
- Information needed by crews or contractors

WA's Place in Weatherization

Documentation Standards

- **Sufficient Documentation:**
  - Conditions relevant to scope of work.
  - Contractors and crews understand
    - Scope of work
    - Required materials
  - Avoid duplication of effort ***whenever possible.***

WA's Place in Weatherization

Documentation Standards

- **Program Compliance:**
  - Work completed according to MNWAP Policy

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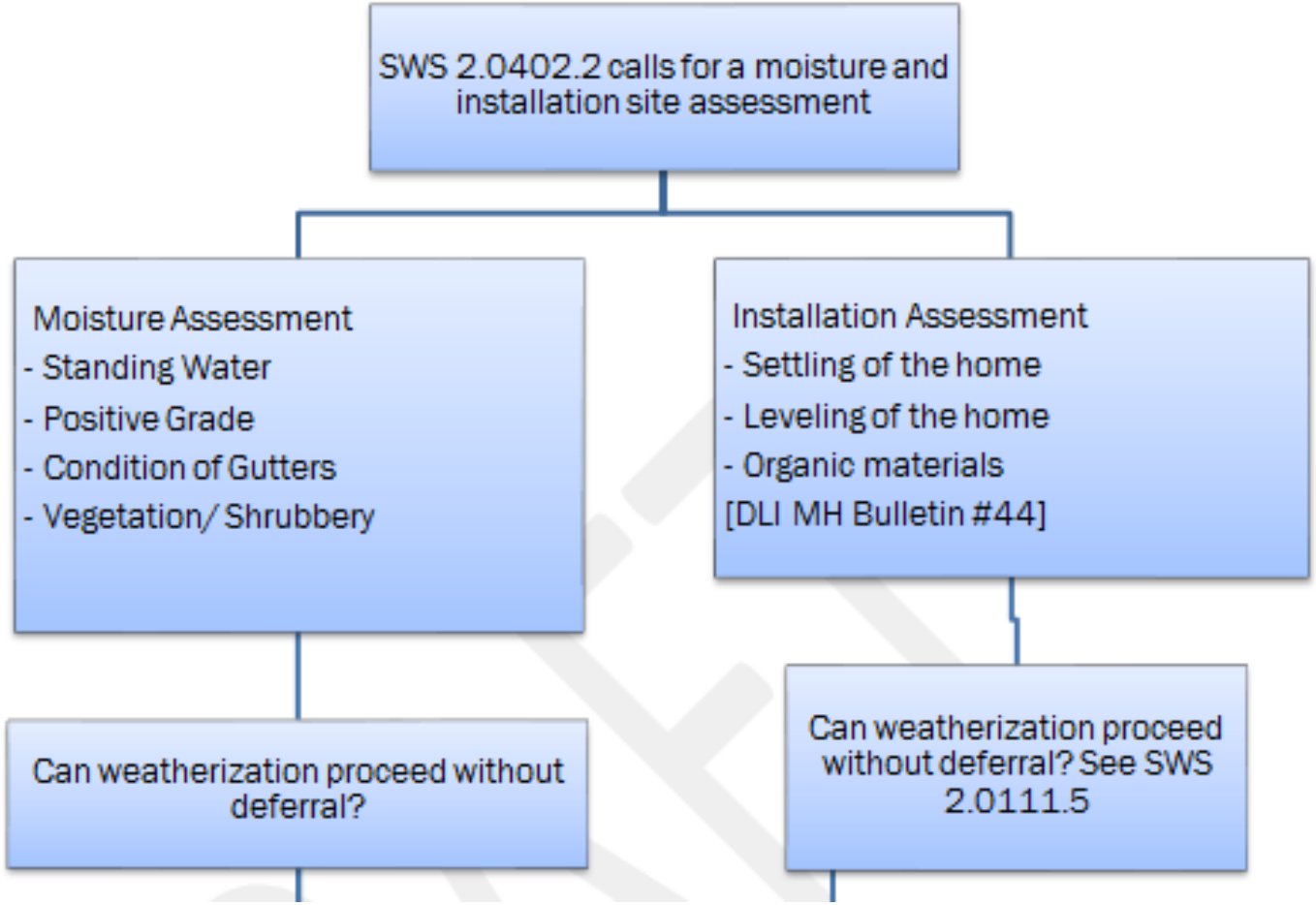
Can this MH be Weatherized?

Mobile Home Site Assessment



Mobile Homes Site Assessment

- Draft Site Assessment Policy
  - Follows SWS and DLI Guidance
  - Please send us feedback by 6/6/16
- Relates to Deferral Policy
  - Change in the Draft State Plan
    - *Must Defer if the condition of the structure would make weatherization impossible or impractical (e.g. inability to meet SWS)*

Mobile Home Site Assessment

- **Service Providers *must* defer:**
  - *The condition of the structure would make weatherization impossible or impractical (e.g. inability to meet SWS)*
- **Service Provider *may* defer:**
  - The building structure or its mechanical systems, including electrical and plumbing, are in such a state of disrepair that failure is imminent and the conditions cannot be resolved cost effectively.
  - Moisture problems are so severe they cannot be resolved under existing health and safety measures and with minor repairs.
  - In the judgment of the energy auditor, any condition exists which may endanger the health and/or safety of the work crew or subcontractor, the work should not proceed until the condition is corrected.

Mobile Home Site Assessment

DLI Manufactured Home Bulletin 44

Frost Footings

"Used manufactured homes (single and multi-section) may be installed without frost depth footings even if frost depth footings were required in the manufacturer's installation manual."

Mobile Home Site Assessment

SWS 2.0402.2

- a. Installer pre-work assessment will determine:
  - Standing water
  - Positive grade/drainage
  - Conditions of gutter system
  - Vegetation/shrubbery
  - Settling of home
  - Leveling of home
  - Ensure no organic material is under the supports, including topsoil and roots

.

Mobile Home Site Assessment

SWS 2.0111.5

a. Any installation deficiencies that may affect worker safety or integrity or installed measures will be repaired before starting work

Mobile Home Site Assessment

Minnesota is asking for a Variance for

SWS 2.0403.4

- a. If existing conditions of the ground and skirting mandates, a moisture barrier that covers the crawl space ground will be installed with allowances for structural supports (piers) and accessibility.

Mobile Home Site Assessment

Allowable Measures Chart

Section 6 FOUNDATION (EXTERIOR)				
ACTIVITY/MEASURE NAME	MEASURE TYPE CHOICES			
	PREFERRED (1st choice)	ACCEPTABLE (2nd choice)	LEAST DESIRABLE (3rd choice)	
Insulate from exterior of the home	Insulation	None	None	
Seal air leakage.	Air sealing	None	None	
Raise/change exterior grade.	HSM	None	None	Must have prior approval f
Structural repair or manufactured home raising or leveling	NOT ALLOWED			

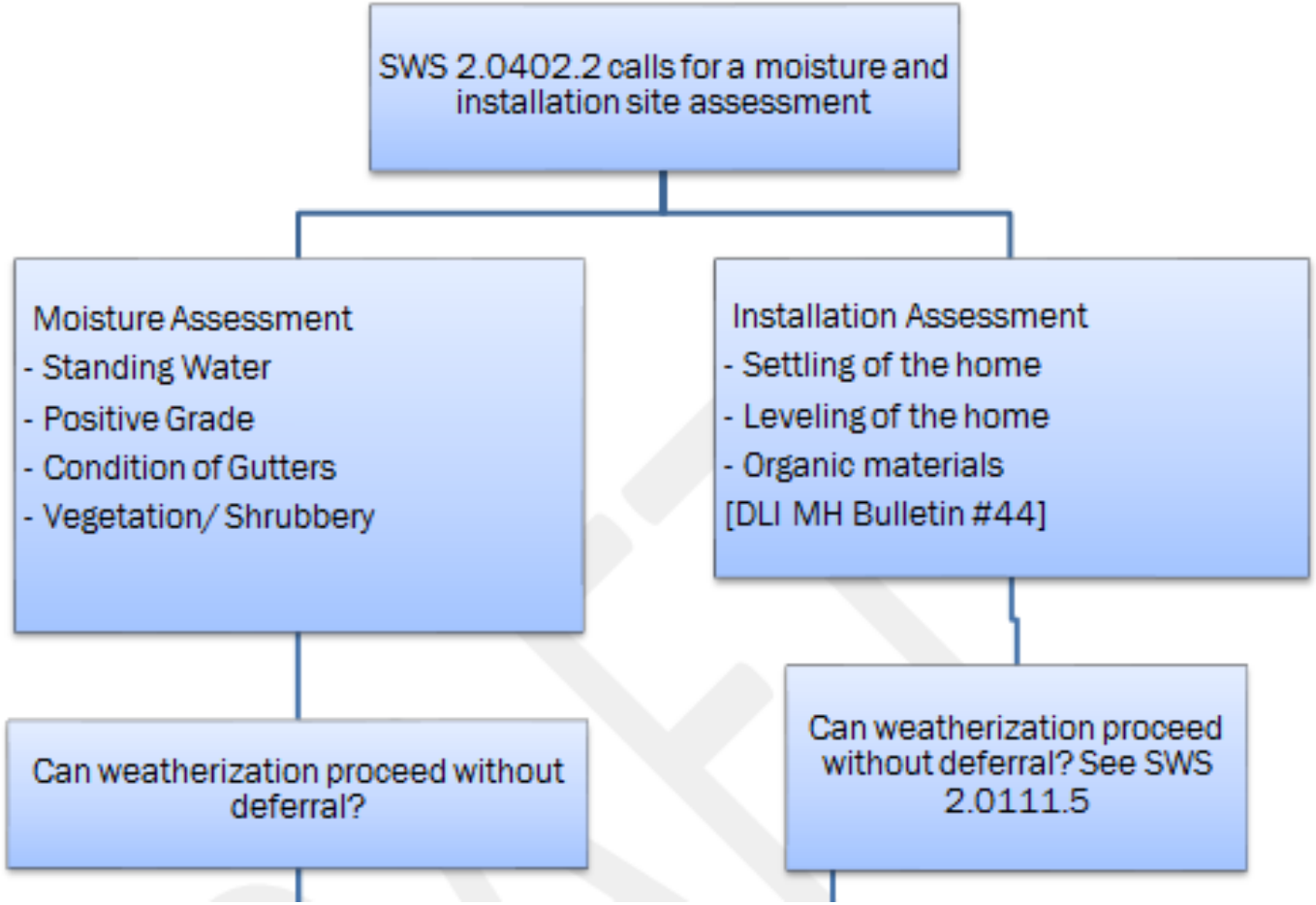
Mobile Home Site Assessment

Allowable Measures Chart

Section 24 MOBILE HOME MISCELLANEOUS

ACTIVITY/MEASURE NAME	MEASURE TYPE CHOICES			
	PREFERRED (1st choice)	ACCEPTABLE (2nd choice)	LEAST DESIRABLE (3rd choice)	
repair mobile home belly.	Air Sealing	Insulation	IRM	Seal ductwork and boots with air s may only be used If the Measure p ensures the effectiveness of an ins
Insulate mobile home belly.	Insulation	None	None	Cellulose is not an allowed materi
Insulate floor of stick built mobile home addition.	Insulation	None	None	
Install poly underneath a mobile home.	**NOT ALLOWED**			
Install/repair skirting on mobile home or addition to mobile home.	**NOT ALLOWED**			

Mobile Home Site Assessment



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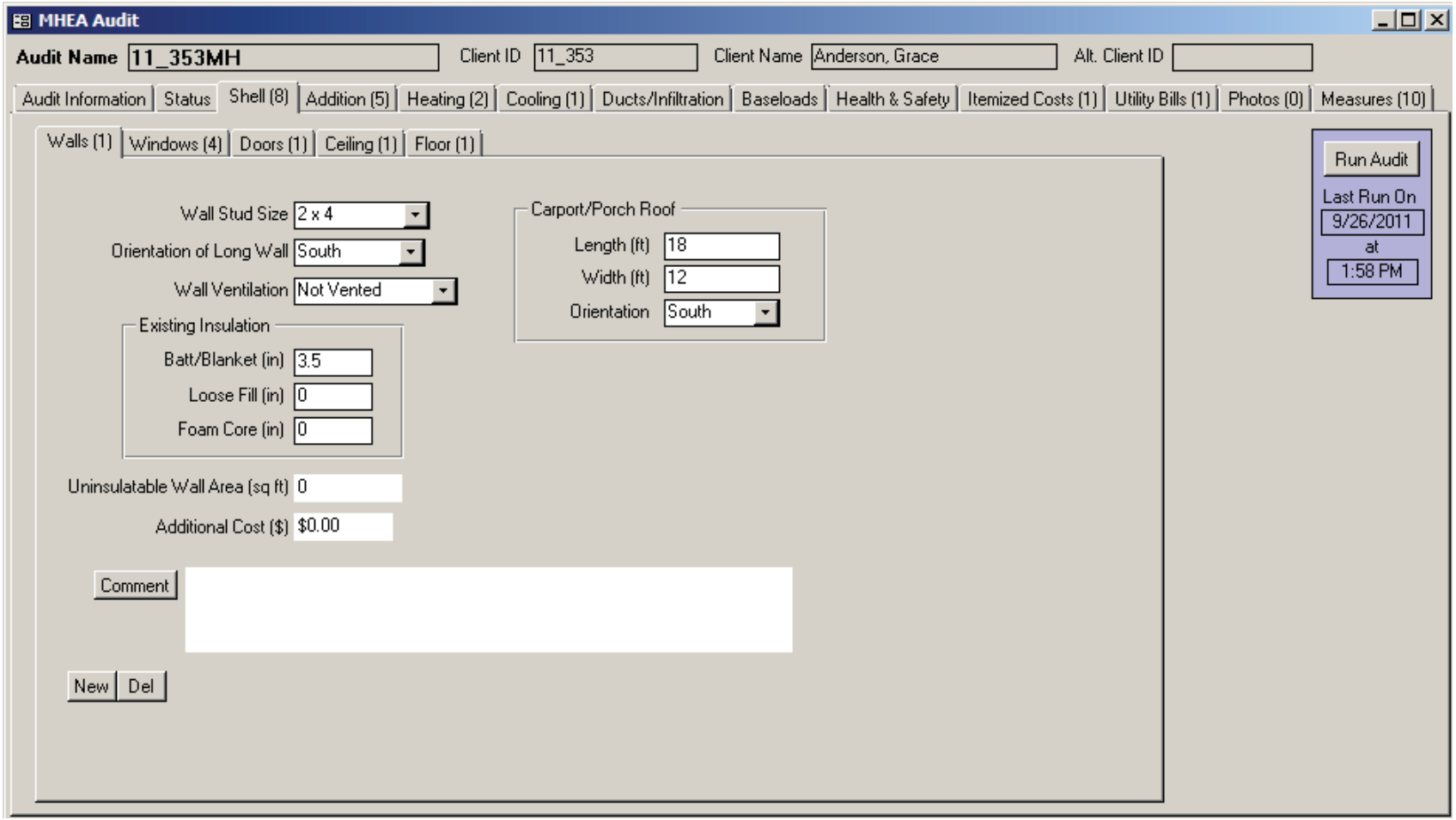
MHEA Modeling



MHEA Modeling—Questions

- Time is limited
  - Data entry questions—OK
  - Policy Discussions—Another Time
    - Please write other questions on feedback form

MHEA Modeling

- Data Plate
  - Age
  - Wall insulation R value
  - Attic insulation R value
  - Floor insulation R value

MHEA Modeling – Floor

- New Method from Oak Ridge National Labs
  - Replaces Current Method
  - New Method
    - Tested and defensible
    - Accurate energy modeling
    - Cost correction required
      - We need: square feet of belly repair vs.
      - MHEA gives us: amount of insulation blown into entire belly in bags

MHEA Modeling – Floor

- Data Plate
  - Total R value of floor
  - R value per inch of the existing material
- Total square footage of the floor (Length, Width)
  - MHEA assumes half wing, half belly
- Total square footage of damaged floor
  - Wing
  - Center
- Total cost per square foot of floor repair
  - Wing
  - Center

MHEA Modeling – Floor

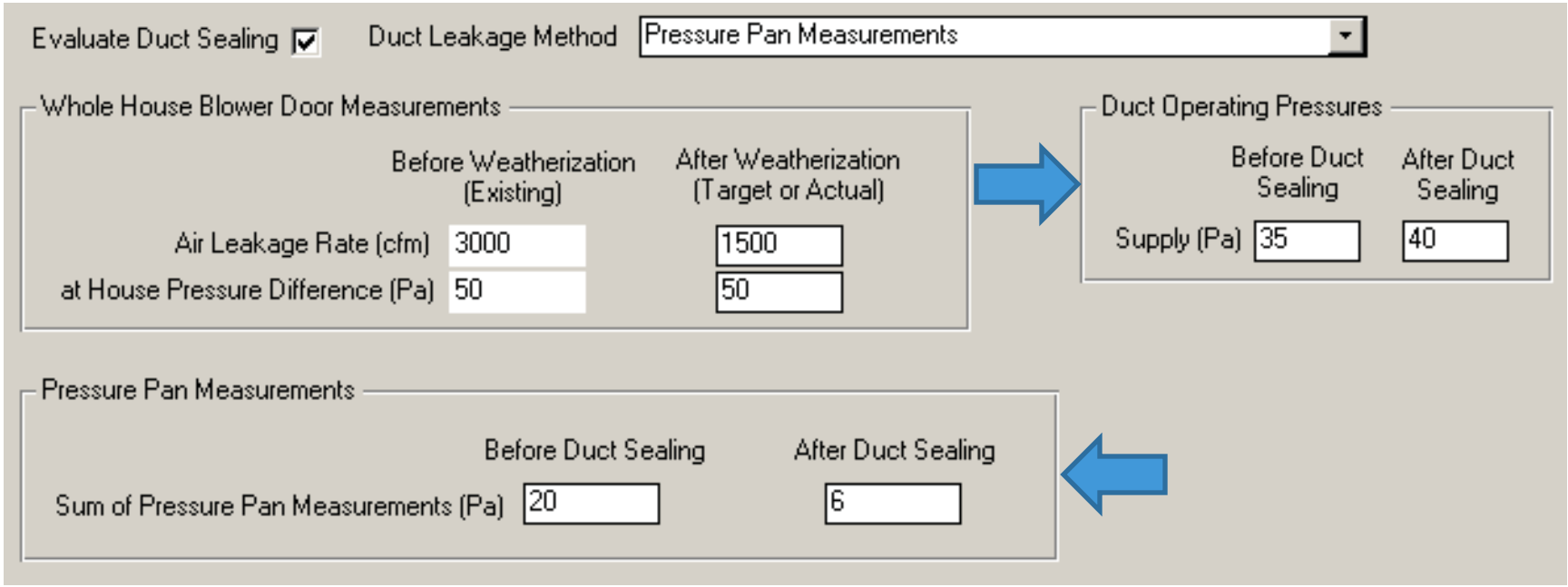
MHEA Floor Repair Modeling Tool

Mobile Home Details		
Length of mobile home (ft)	50	
Width with of mobile home(ft)	14	
R-value of the undamaged area	19	
R-value of existing insulation (R/inch)	3	typically R3

Averaged Insulation	Belly	Wing	
Damaged area (sqft)	56	20	
Averaged insulation (R-value)	14.6	19.1	
Averaged insulation (inch)	3.5	5.0	To be entered into MHEA

Cost Information		
Cost/sqft of repair and insulation ($)	$ 5.00	
Total cost of repair ($)	$ 380.00	To match work order

Duct Sealing Modeling



Duct Sealing Modeling

- **Sum of Pressure Pan Measurements**
  - Blower Door, Pressure Pan, Manometer
  - Post Duct Sealing Goal: The number of ducts x 1.0
- **Supply Duct Operating Pressures**
  - A total of four register readings ***per trunk***
    - At the farthest ends of the trunk line
    - Closest to the furnace on either side
  - Long static pressure probe, Manometer
  - After Duct Sealing Goal: Add 5 PA to the pre-weatherization duct operating pressure.

Questions and Feedback

weatherization.commerce@state.mn.us

Thank You

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